C 13.22/sec. B:74 B/t. p. & cont.
Public Documents Division
Oklahoma Department of Libraries
MAY 14 1971

UNITED STATES DEPARTMENT OF COMMERCE • Maurice H. Stans, *Secretary*
NATIONAL BUREAU OF STANDARDS • Lewis M. Branscomb, *Director*

Mathematical Sciences

SECTION B

JOURNAL OF RESEARCH

of the

NATIONAL BUREAU OF STANDARDS

Volume 74B—January to December 1970

Papers 74B1–313 to 74B4–338

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Corrections to be noted in Volume 74B of the JOURNAL OF RESEARCH of the National Bureau of Standards—B. Mathematics and Mathematical Physics

Page	Column	Line	Now reads in part	Should read
14		23	$(n+m)$	$\binom{n+m}{m}$
32		3	$r!p_r=\begin{vmatrix} A_1 & & & \\ A_2 & A_1 & & \\ A_3 & \cdots & \cdots & \\ A_{r-1} & & & \end{vmatrix}$	$r!p_r=\begin{vmatrix} A_1 & & & \\ A_2 & A_1 & & \\ A_3 & \cdots & \cdots & \\ A_r & & & \end{vmatrix}$
		last line of eq (6)	A_{4-4}	A_{r-4}.
33		last line of eq (14)	$!h_j^k$, (13).	$!h_j^k$, by (13).
34		4	(14).	(15).
80	1	23	Thermal $B^*(\infty)=\gamma B_S$, $1<\gamma<2$.	Thermal $B^*(\infty)=\gamma B_S$.
		26	$\gamma=0$.	$\gamma=2$.
102	1	19	with respect to P, F	with respect to P, if.
158		13	$\mathscr{L}^{-1}\left\{s^{\frac{n-1}{2}}\epsilon^{-k_2 s^{1/2}}\right\}$	$\mathscr{L}^{-1}\left\{s^{\frac{n-1}{2}}\epsilon^{-k_2 s^{1/2}}\right\}$.
161		6	$\frac{1+\epsilon^{-2l\gamma(s)}}{-\rho_{s0}(s)\epsilon^{-2l\gamma(s)}}$	$\frac{1+\epsilon^{-2l\gamma(s)}}{1-\rho_{s0}(s)\epsilon^{-2l\gamma(s)}}$.
162		19	$A_1^{(2)}=\eta_0-\eta^{1/2}$,	$A_1^{(2)}=\eta_0-\eta_2^{1/2}$,.
165		16	$\sum_{n=0}^{\infty}{}'/$	$\sum_{n=0}^{\infty}{}'$.
		23	$\sum_{n=0}^{[\tau]}{}'/$	$\sum_{n=0}^{[\tau]}{}'$.
168		1	Number of eq is not given.	(6.17).
		Fig 2 Caption	$(1\sqrt{LC})$	$l\sqrt{LC}$.
			Figure 2 . . . . removed.	Figure 2 . . . . removed [6].
169		Fig 3 Caption	$(1\sqrt{LC})$	$l\sqrt{LC}$.
			Figure 3 . . . . removed.	Figure 3 . . . . removed [6].
		Fig 4 Caption	Figure 4 . . . delay.	Figure 4 . . . . . delay [6].
169		Fig Captions 2, 3, 4	For additional information, contact the author.	

CONTENTS OF VOLUME 74B

Volume 74B—No. 1—January–March 1970

Page

Partitions—a survey. Hansraj Gupta..... 1

A relation between the coefficients and roots of two equations and its application to diophantine problems. T. N. Sinha..... 31

An enumeration problem for a congruence equation. Richard A. Brualdi and Morris Newman..... 37

Orthogonal decompositions of tensor spaces. Stephen Pierce..... 41

Partitioned hermitian matrices. Russell Merris..... 45

Bounds on a polynomial. T. J. Rivlin..... 47

Entire functions of exponential type. Fred Gross..... 55

Publications of the National Bureau of Standards..... 61

Volume 74B—No. 2—April–June 1970

Acoustic propagation and stability within an inviscid, heat-conducting fluid. J. E. McKinney and H. J. Oser..... 67

On some indefinite integrals of confluent hypergeometric functions. Edward W. Ng and Murray Geller..... 85

On complementary polar conical sets. Christoph Witzgall..... 99

On contractive semigroups and uniform asymptotic stability. Philip R. Meyers..... 115

Normal subgroups of the modular group. Leon Greenberg and Morris Newman..... 121

Publications of the National Bureau of Standards..... 125

Volume 74B—No. 3—July–September 1970

Hecke basis theorems for groups of genus O. Marvin I. Knopp and John Roderick Smart..... 131

The distribution of eigenvalues of covariance matrices of residuals in analysis of variance. John Mandel..... 149

Expansions with coefficient algorithms for time domain responses of skin effect lossy coaxial cables. D. R. Holt..... 155

Derivatives of the Grüneisen and Einstein functions. Ared Cezairliyan..... 175

Selecting nonlinear transformations for the evaluation of improper integrals. T. A. Atchison..... 183

On the spheroidal functions. Donald R. Rhodes..... 187

Automatic computing methods for special functions. Irene A. Stegun and Ruth Zucker..... 211

Publications of the National Bureau of Standards..... 225

Volume 74B—No. 4—October–December 1970

A property of the triangle groups. Joseph Lehner..... 231

Some theorems on tensor composite graphs. Michael F. Capobianco..... 235

The diophantine approximation of roots of positive integers. Charles F. Osgood..... 241

Page

The minimum number of problems to cover all subproblems. H. J. Greenberg..... 245

Error estimates for the solution of linear algebraic systems. Brother Kenneth E. Fitzgerald, F.S.C..... 251

On the singular values of a product matrices. William Watkins..... 311

Contractifiable semigroups. Philip R. Meyers..... 315

Publications of the National Bureau of Standards..... 323

Index to Volume 74B, January to December 1970..... 331

☆ U.S. GOVERNMENT PRINTING OFFICE : 1971 OL—418—740

JOURNAL OF RESEARCH of the National Bureau of Standards—B. Mathematical Sciences
Vol. 74B, No. 4, October–December 1970

INDEX TO VOLUME 74B

January to December 1970

A

Page

Absorption 67
Acoustic propagation and stability within an inviscid heat-conducting fluid 67
Analysis of variance 149
Approximations 211
Asymptotic expansions 187
Atchison, T. A., Selecting nonlinear transformation for the evaluation of improper integrals 183
Automatic computing methods for special functions 211

B

Bernstein polynomials 47
Bessel functions 85, 187
Bounded index 55
Bounds 47
Bounds on a polynomial 47
Brualdi, R. A., Newman, M., An enumeration problem for a congruence equation 37

C

Capobianco, M. F., Some theorems on tensor composite graphs 235
Cezairliyan, A., Derivatives of the Grüneisen and Einstein functions 175
Circulants 37
Coefficient algorithms 155
Combinatorics 245
Computer programs 211
Computing pitfalls 211
Confluent hypergeometric functions 85
Congruences 1, 37
Conjugate functions 99
Continued fractions 211
Contractifiable semigroups 315
Contractions 115, 315
Control theory 115
Convariance matrix 149
Convex cones 99
Convexity 55

D

Derivatives of the Grüneisen and Einstein functions 175
Digraphs 235
Diophantine approximation 241
Diophantine approximation of roots of positive integers 241
Diophantine equation 241
Diophantine equations 31
Distribution of eigenvalues of covariance matrices of residuals in analysis of variance 149
Duality 99
Dynamic programming 245

E

Effective computability 241
Eigenvalues 149, 187
Einstein function 175
Eisenstein series 131
Electrical resistivity 175
Eoectronic energies 85
Element of finite order 231
Entire function 55
Entire functions of exponential type 55
Enumeration problem for a congruence equation 37
Error estimates 251
Error estimates for the solution of linear algebraic systems 251
Error function 211
Evaluation of computer programs 251
Expansions 155
Expansions with coefficient algorithms for time domain responses of skin effect lossy coaxial cables 155
Exponential type 55

F

F-group 231
Fitzgerald, K. E., Error estimates for the solution of linear algebraic systems 251
Functional analysis 115, 315

G

Gegenbauer functions 187
Geller, M., Ng, E. W., On some indefinite integrals of confluent hypergeometric functions 85
Generalized matrix function 45
Generating functions 1
Genus 121
Graphs 235
Greenberg, H. J., The minimum number of problems to cover all subproblems 245
Greenberg, L., Newman, M., Normal subgroups of the modular group 121
Gross, F., Entire functions of exponential type 55
Grüneisen function 175
Gupta, H., Partitions—A survey 1

H

Heat-conducting 67
Hecke basis theorems for groups of genus O 131
Hecke group 131
H-group 131
Hermitian matrix 45
Holt, R. D., Expansions with coefficient algorithms for time domain responses of skin effect lossy coaxial cables 155

I

Identities 1
Improper integral 183
Indefinite integrals 85
Index 121
Interaction 149
Inverse Laplace transform 155
Inverse of a matrix 251
Inviscid 67
Irreducible character 41
Isothermal 67

K

Kirchhoff-Langevin equation 67
Knopp, M. I., Smart, J. R., Hecke basis theorems for groups of genus O 131

L

Legendre functions 187
Lehner, J., A property of the triangle groups 231
Linear programming 99
Linear systems and matrices 251

M

Mandel, J., The distribution of eigenvalues of covariance matrices of residuals in analysis of variance 149
Mathieu functions 187
Matrices 311
Matrix 149
Maximum modulus 55
McKinney, J. E., Oser, H. J., Acoustic propagation and stability within an inviscid heat-conducting fluid 67
Merris, R., Partitioned hermitian matrices 45
Meyers, P. R., Contractifiable semigroups 315
———, On contractive semigroups and uniform asymptotic stability 115
Minimum number of problems to cover all subproblems 245
Modular form 131
Modular group 121

N

Newman, M., Brualdi, R. A., An enumeration problem for a congruence equation 37
———, *Greenberg, L.*, Normal subgroups of the modular group 121
Ng, E. W., Geller, M., On some indefinite integrals of confluent hypergeometric functions 85
Nonlinear transformation 183
Normal subgroup 231
Normal subgroups 121
Normal subgroups of the modular group 121

O

On the singular values of a product matrices 311
On complementary polar conical sets 99
On contractive semigroups and uniform asymptotic stability 115
On some indefinite integrals of confluent hypergeometric functions 85
On the spheroidal functions 187
Optimization 245
Orthogonal decomposition of tensor spaces 41
Orthogonality 99
Orthogonalization 187
Oser, H. J., McKinney, J. E., Acoustic propagation and stability within an inviscid heat-conducting fluid 67
Osgood, C. F., The diophantine approximation of roots of positive integers 241

P

Parametrization of cusp forms 131
Partitioned hermitian matrices 47
Partitions 1
Partitions—A survey 1
Permanents 37
Pierce, S., Orthogonal decomposition of tensor spaces 41
Polarity 99
Polynomials 47
Positive semi-definite hermitian matrix 45
Products 235
Property of the triangle groups 231
Prouhet-Tarry-Escott problem 31

R

Recurrence formulas 1
Recurrence relations 211
Reflectometry 155
Relation between the coefficients and roots of two equations and its application to diophantine problems 31
Residuals 149
Rhodes, D. R., On the spheroidal functions 187
Rivlin, T. J., Bounds on a polynomial 47

S

Selecting nonlinear transformations for the evaluation of improper intergrals 183
Semigroup 115
Series 211
Singular values 311
Sinha, T. N., A relation between the coefficients and roots of two equations and its application to diophantine problems 31
Skin effect 155
Smart, J. R., Knopp, M. I., Hecke basis theorems for groups of genus O 131
Solid-state physics 175
Some theorems on tensor composite graphs 235
Stability 67
Stability theory 115, 315
Steady-state 67
Stegun, I. A., Zucker, R., Automatic computing methods for special functions 211
Step response 155
Symmetric functions 31
Symmetry class of tensors 41
Symmetry operator 41
System function 155
Systems of distinct representatives 245

T

Tensor 235
Tensor product 41
Theory of computation 245
Thermal 67
Topology 115
Transient 67
Transmission 155
Transport properties 175
Trees 235
Triangle group 231
Two-way table 149

V

Vacuum cleaner 149

W

Watkins, W., On the singular values of a product matrices 311
Witzgal, C., On complementary polar conical sets 99

Z

Zucker, R., Stegun, I. A., Automatic computing methods for special functions 211

U.S. GOVERNMENT PRINTING OFFICE : 1971 O—406-680